

REMARKS

All pending claims 1 to 3 and 5 to 11 have been rejected under 35USC 103(a) on Cromeens '513 in view of Ono '540. Claims 5 to 9 are rejected as above with a third reference Kraft '910.

The best reference cited is a dicing saw Ono '540 which shows two housing. The inner housing 96, 100 is axially movable in an outer housing 90,44. Fig. 3 shows two separate and distinct saw blades 156A and 156B which have their own support frames, drive shafts, and drive motors. Each support frame is adjustable vertically by levers etc. and two support frames are moved axially together with inner housing 96,100. Applicant's invention eliminates one of the housings and one of the two support frames. Since applicant's two saw blades cut a wafer at the same time (not sequentially), the applicant's new saw with two blades cuts (dices) a wafer at least 30 percent faster. This reference was discussed in the original filed application at page 7 and is shown in Fig. 2B as prior act.

The principal reference cited is Cromeens '513 and is not a dicing saw and cannot be modified for use as a dicing saw. The title is a telescoping arbor assembly. The abstract explains the arbor assembly and a plurality of rippling saw blades mounted on an axle shaft 16 and each other's sleeve. The outer sleeve 15 or tube is driven by pulley 21 which cannot move in the axial or x-direction. Clearly blade 11 does not move in the horizontal direction. The reference does not show or explain how axle shaft 16 or saw blades 7 to 10 are moved horizontally or how tubes 12 to 15 are coupled to pulley 21 or axle 16.

Claim 1 calls for a cutting saw for dicing wafers. Cromeens is a wood saw and this reference cannot be combined with Ono which is a dicing saw. Any attempt to combine this

reference produces an inoperable saw at best and should not even qualify as a hindsight reference!

Claim 1 calls for a spindle housing. Cromeens has no spindle housing.

5 Claim one calls for a wafer cutting saw. Cromeens has no wafer cutting saw and teaches away to a wood saw which is big and thick with teeth.

10 Claim 1 calls for a spindle mounted in said spindle housing for movement therewith. Cromeens has no spindle housing and his base plate, which supports his spindle, does not move.

15 Claim one calls for "an outer" hollow spindle mounted on said "center spindle- - - for axial movement relative thereto". Note that Cromeens has a pulley 21 on his outer spindle. Therefore, the pulley and outer tube does not ever move horizontally. Further, the outer tube is mounted on other tubes. Applicant has amended claim 1 at line 14 to make this distinction more clear.

20 Claim 1 calls for second mounting means for axially positioning a second cutting saw blade on said outer hollow spindle. Cromeens does not show or describe any means for actually positioning any of his six wood saw blades.

25 Claim one calls for a spindle drive motor directly coupled to said spindles, Cromeens uses a belt and pulley to drive his outer tube. Claim 1 has been amended to more clearly distinguish this element over Cromeens.

30 Claim one calls for spindle positioning means on said spindle housing coupled to one of said spindles for accurately positioning one of said two cutting saw blades relative to the other - - -. Cromeens does not show or describe any spindle positioning means, least alone anything

related to accurately positioning as is required for applicant's dicing saw claims.

Claim one calls for two dicing saw blades in one spindle housing for simultaneously dicing said wafer. 5 Applicant contends that there is no such structure in the dicing saw arts. Applicant is aware that at least one competitor plans to copy this novel structure because it is cheaper to build as a dicing saw and increases throughput production!

10 Of the preamble and 8 elements in claim 1, Ono teaches a complex mechanism for positioning one of his two housings which support two spindle housings. Thus, the spindle positioning means cited, does not teach that which the applicant claims.

15 As discussed above Ono has two saw blades and two separate spindles 152A and 152B in two separate support frames 136. The support frames 136 are movable in the horizontal direction. However, Cromeens does not teach four spindles in two spindle housings as called for by claims 2  
20 and 3.

Claims 5, 6 and 9 are dependant from allowable claim 1 and are claiming Applicant's novel coaxial spindle air bearing structure. Since claims 5, 6 and 9 are dependent from claim 1 and add new structure to claim 1, they 25 should be deemed to be allowable as is claim 1. These claims are rejected on the same cited art as claim 1 plus Kraft '910. Kraft was obviously cited to show some form of air bearing, which it does. However, Kraft shows six flat plane air bearing elements 21 which are so different from 30 Applicant's claims that they cannot be modified for use in Applicant's structure being claimed. Claim 9 is dependent from claims 6 and 5 and adds a movable actuating arm coupled to the outer spindle. Kraft has no such structure.

Claims 7 and 8 are dependent from claims 6, 5 and 1 and were rejected on the same art as claims 5 and 6 with a fourth reference Mueller et al. '127 cited for showing a voice coil structure of the type used in audio speakers.

5 Mueller et al. does not fall into this category!

The structure cited has a movable coil which is attracted to a permanent magnet. The coil is attached to a punch rod which moves when actuated. The "punching" mechanism does not position anything least alone an outer spindle 10 as called for by claim 7. Claim 8 adds an actuating arm for positioning the outer spindle. Mueller et al. cannot be combined into the other references and there is no suggestion how to attempt such major rebuild of the principal reference.

15 Claim 1 is clearly allowable for the reasons stated above. Claims 7 and 8 add novel structure to claim 1 and are clearly allowable also.

In summary, none of the elements claimed in claim 1 are found in the cited art. Similar as they are to the 20 cited art, the cited art elements cannot be used in the structure of claims 1 to 3 and 5 to 9.

The Examiner does not include a new rejection of claims 10 and 11.

These claims are dependent from allowable claims 25 and add novel structure, thus should be allowable also.

The Examiner states that "it is believed that it is possible to dice [silicon] wafers with blades 6 and 7" used for cutting wood. The semiconductor industry uses diamond saw blades to cut silicon wafers the same as Ono cited! 30 The belief is respectfully traversed.

Claim 1 has been amended to more clearly distinguish over the cited art. Applicant contends the eight elements of claim 1, as claimed, are not shown or suggested by

the cited art. The new dicing saw increases production in a fab plant by about thirty percent and is manufactured at lower cost. The novel coaxial spindle heads can be retrofitted on existing designs of saws or even some existing saws. All dependent claims are dependent from allowable claim 1 which is clearly allowable over all known cited art.

5 Claims 1 to 3 and 5 to 11 are now in this Application ready for issue and such favorable action is respectfully requested. The status of all claims under examination is also enclosed.

10 A marked up version of amended claim 1 is enclosed.

A Petition for Extension of Time to Reply is enclosed.

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Respectfully submitted,

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John B. Sowell - Attorney  
Registration No. 19,151

JBS/cbc

Enclosures (3)

Direct Tel (610) 649-4815

Direct Fax (610) 649-8143



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MARKED UP CLAIMS SHOWING CHANGES MADE

WHAT IS CLAIMED IS:

1. (Currently amended). A coaxial spindle cutting saw for dicing wafers and singulating substrates, comprising:
  - 5 a spindle housing for mounting on a wafer cutting saw for axial movement,
    - 10 a coaxial spindle mounted in said spindle housing for movement therewith,
      - 15 said coaxial spindle comprising a center spindle having first axially movable mounting means for positioning a first cutting saw blade mounted on said center spindle,
      - 20 said coaxial spindle further comprising an outer hollow spindle mounted directly on said center spindle for rotation therewith and for axial movement relative thereto,
      - 25 second mounting means for axially positioning a second cutting saw blade on said outer hollow spindle,
    - 20 a spindle drive motor coupled to said spindles for rotating both said center spindle and said outer hollow spindle together at the same rotational speed,
    - 25 spindle positioning means on said spindle housing coupled to one of said spindles for accurately positioning one of said two cutting saw blades relative to the other cutting saw blade, and
  - whereby, said first cutting saw blade and said second cutting saw blade comprise two dicing saw blades in one spindle housing for simultaneously dicing said wafer.